

Standard Reference Material[®] 1473c

Low Density Polyethylene Resin

CERTIFICATE

Purpose: This Standard Reference Material (SRM) is intended for use in calibration and performance evaluation of instruments used in polymer technology and science for the determination of the melt flow rate using ASTM D1238-13, Test Method for Flow Rates of Thermoplastics by Extrusion Plastometer [1] Standard Test Condition 190/2.16.

Description: A unit of SRM 1473c consists of approximately 60 g of white polyethylene pellets in an amber glass bottle.

Certified Values: This material is certified for melt flow rate using ASTM D1238-13 [1]. The flow rate of the melt was determined at $190.0\text{ °C} \pm 0.1\text{ °C}$ and a load of 2.16 kg by procedure A of the ASTM method. A manually operated extrusion plastometer was used. Under these conditions, the certified melt flow rate for this material is as follows:

Melt Flow Rate (FR): $1.16\text{ g/10 min} \pm 0.097\text{ g/10 min}$

The measurand is the flow rate. Metrological traceability is to the SI units for mass and time (expressed as grams per ten minutes) [2]. Fifteen units of the SRM were measured in duplicate by NIST according to the procedures of ASTM D1238-13 [1]. The certified melt flow rate is the weighted mean of the NIST measurements estimated using a Gaussian random effects model [3–5] and the DerSimonian Laird procedure [6,7]. The associated measurement uncertainty was evaluated by an application of the parametric statistical bootstrap, consistent with the ISO/JCGM Guide and its Supplement 1 [8–11]. The expanded uncertainty, U , is calculated as $U = ku_c$, where u_c is intended to represent, at the level of one standard deviation, the combined effects of the within unit measurement uncertainty (0.0025 g/10 min), unit-to-unit variability (0.0055 g/10 min), uncertainty in the temperature measurement within the plastometer cylinder (0.02 g/10 min), and the uncertainty due to laboratory-to-laboratory variability (calculated based on Table 4 of ASTM D 1238-13, 0.0449 g/10 min). The expansion factor, $k = 1.96$, corresponds to an approximately 95 % confidence level.

Additional Information: Additional information is provided in Appendix A.

Period of Validity: The certification of **SRM 1473c** is valid, within the measurement uncertainty specified, until **01 January 2028**. The certified values are nullified if the material is stored or used improperly, damaged, contaminated or otherwise modified.

Maintenance of Certified Values: NIST will monitor this SRM over the period of its validity. If substantive technical changes occur that affect the certification, NIST will issue an amended certificate through the NIST SRM website (<https://www.nist.gov/srm>) and notify registered users. SRM users can register online from a link available on the NIST SRM website or fill out the user registration form that is supplied with the SRM. Registration will facilitate notification. Before making use of any of the values delivered by this material, users should verify they have the most recent version of this documentation, available through the NIST SRM website (<https://www.nist.gov/srm>).

Storage: The SRM should be stored in the original bottle with the lid tightly closed and under normal laboratory conditions.

Homogeneity: The homogeneity of SRM 1473c was tested by melt flow rate measurements using ASTM D1238-13 [1]. The polymer was characterized in the same manner as described in reference 12.

REFERENCES

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| Certificate Revision History: 14 November 2022 (Change of period of validity, editorial changes); 03 December 2021 (Change of expiration date; updated format editorial changes); 19 October 2020 (Change of expiration date; editorial changes); 23 September 2016 (Original certificate date). |
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Certain commercial equipment, instruments, or materials may be identified in this Certificate to adequately specify the experimental procedure. Such identification does not imply recommendation or endorsement by the National Institute of Standards and Technology, nor does it imply that the materials or equipment identified are necessarily the best available for the purpose.

Users of this SRM should ensure that the Certificate in their possession is current. This can be accomplished by contacting the Office of Reference Materials 100 Bureau Drive, Stop 2300, Gaithersburg, MD 20899-2300; telephone (301) 975-2200; e-mail srminfo@nist.gov; or the Internet at <https://www.nist.gov/srm>.

***** End of Certificate *****

APPENDIX A

Coordination of the technical measurements leading to certification of this SRM was provided by K. Migler of the NIST Materials Science and Engineering Division.

Technical measurement and data interpretation were provided by W.G. McDonough and C.M. Guttman of the NIST Materials Science and Engineering Division.

Statistical analysis was provided by D.D. Leber of the NIST Statistical Engineering Division.

Support aspects involved in the issuance of this SRM were coordinated through the NIST Office of Reference Materials.

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